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*FOSSIL PLANTS FROM THE LATE CRETACEOUS OF
TENNESSEE*

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That part of the Atlantic Coastal Plain known as the Mississippi Embayment is one of strategic paleobotanical interest. It is a region unacquainted with orogenesis and remote from vulcanism, a region on the threshold as it were of the present-day tropics, far removed from glaciation, and with a relatively simple geological history. Hence the Gulf Coastal Plain affords a unique opportunity for studying the almost unbroken evolution of floras from the Cretaceous to the present. Many of these floras have been described in recent years, the two large unknown gaps in the record having been a knowledge of the later Upper Cretaceous and the Miocene floras. The latter still remains to be discovered, but information regarding the former will now be available through the fortunate discoveries by Dr. Bruce Wade during the summer of 1919. In working near the boundary between the Coastal Plain and the Paleozoic rocks which form its margin and basement in western Tennessee several clay lenses with an abundant varied and well-preserved representation of the flora of the Ripley formation were discovered. The Ripley formation is the latest Cretaceous known in this region and is overlain unconformably by the basal Eocene. Its sediments, in general shallow water marine sands, with many suggestions of plants in their carbonaceous silt have heretofore yielded but few and fragmentary representatives of the forests which clothed the shores of the Ripley sea—such things as leaves or broken twigs of Araucarian or other conifers, and a few of the more coriaceous dicotyledonous leaves that chanced to settle in its waters. The clay lenses in Henry and Carroll counties are of fine-grained and pure material, evidently the sediments of quiet estuarine or lagoonal waters close to a forested shore and perhaps the distributaries of slow streams or bayous traversing a richly forested country. The collected representatives of this flora contain some surprises in the survival of what have been considered earlier forms, and have an important bearing on correlation as well as affording a fair picture of the general facies. These considerations warrant a preliminary announcement.

The most extensive best-preserved and earliest studied Upper Cretaceous floras, both in this country and abroad, have been those in the continental deposits immediately preceding, or in the initial deposits of the transgressing Upper Cretaceous sea, such for example as the Dakota sandstone of Kansas and Nebraska, the Raritan clays of New Jersey, the Peruc beds of Bohemia or the Niederschoena deposits of Saxony. Coming up-

ward in all of the sections the plant evidence has rapidly diminished in both variety and quality. A knowledge of the Ripley flora not only serves to offset this condition and furnish a basis for more precisely evaluating the passing of Cretaceous time, but it introduces us to many of the smaller and more delicate forms that almost invariably fail of preservation in coarse deposits.

Examples of the relative paucity of the later Cretaceous floras of the Atlantic Coastal Plain are furnished by noting that the Tuscaloosa, Raritan and Magothy floras comprise about 150 species each whereas when I published the Upper Cretaceous Floras of the World in 1916 I listed but 9 species from the Ripley formation in Georgia, two from beds of that age in Alabama and three from Tennessee. A foreign parallel may be taken from the Bohemia area. Here the Peruc beds (Cenomanian) have furnished 184 species, the Turonian 47 and the Chlomker beds (Emscherian) but 32.

The present discoveries disclose the remains of 124 species complete enough for descriptive purposes, of which 86 are new to science. They are referred to 62 genera in 38 families and 25 orders. Thirty of the genera or 49% are extinct, and all but one of the species and about a dozen of the genera are not found in the Eocene.

Contrasts with the earlier Upper Cretaceous floras are the scanty representation of the gymnosperms, here reduced to 6 species, and the absence of traces *Sequoia* or cycads. Familiar types not present are *Magnolia*, and *Diospyros*, and there are no certainly identified *Proteaceae*. In a general way the flora suggests slightly warmer climates than those that preceded it during Upper Cretaceous times, and there are a considerable number of types that appear to be ancestral to members of the lower Eocene flora of the Mississippi Embayment region.

The flora contains but 5 ferns, 7 monocotyledons and 105 dicotyledons, of which last 94 are *Choripetalae* and 11 *Gamopetalae*. The largest alliances are the *Leguminosae* with 14 species, the *Lauraceae* with 12, the *Myricaceae* with 11 and the *Moraceae* with 10. The largest genera are *Myrica* with 11 species, *Ficus* with 9 and *Celastrphyllum* with 6.

Compared with floras in other areas the Ripley flora of Western Tennessee shows little in common with the Laramie flora of the West. It does contain a number of elements common to the Montana Group floras, particularly the flora of the Vermejo formation of Colorado and New Mexico. There are also similarities with the flora of the Patoot beds of Greenland and the upper Emscherian and lower Aturian (Campanian) floras of Western Europe.

A complete account of the Ripley flora has been prepared which will be published by the U. S. Geological Survey.